AP Calculus AB
Test: Bridge to Calculus
Instructor's Version

Free-Response Question 1—no calculator (worth 15 points)

1. Given that $f(x) = x^2 - 4$ and that $g(x) = \sqrt[3]{x-1}$:

A. State $(f - g)(x)$ and $(f \circ g)(x)$.

Answer:
$(f - g)(x) = x^2 - 4 - \sqrt[3]{x-1}$ (2 points)

$(f \circ g)(x) = f\sqrt[3]{x-1} = \left(\sqrt[3]{x-1}\right)^2 - 4$ (2 points)

B. State $\left(\frac{f}{g}\right)(x)$ and determine its domain.

Answer:
$\left(\frac{f}{g}\right)(x) = \frac{x^2-4}{\sqrt[3]{x-1}}$ (2 points)

$x - 1 \neq 0 \rightarrow x \neq 1$
The domain is $(-\infty,1) \cup (1,\infty)$ or $\{x \mid x \neq 1\}$. (2 points)

C. Determine whether each of the following functions is odd, even, or neither odd nor even: $f(x) = x^2 - 4$, $g(x) = \sqrt[3]{x-1}$.

Answer:
$f(x) = x^2 - 4 : f(-x) = (-x)^2 - 4 = x^2 - 4 = f(x) \therefore f(x)$ is even. (2 points)
$g(x) = \sqrt[3]{x-1} : g(-x) = \sqrt[3]{-x-1} \neq g(x) \neq -g(x) \therefore g(x)$ is neither even nor odd. (2 points)

D. State $\left(\frac{g}{f}\right)(x)$ and find all vertical asymptotes.

Answer:
$\left(\frac{g}{f}\right)(x) = \frac{\sqrt[3]{x-1}}{x^2-4}$

$x^2 - 4 = 0 \rightarrow x = \pm 2$

$\left(\frac{g}{f}\right)(x)$ has vertical asymptotes at $x = 2$ and at $x = -2$. (1 point for the function and 1 point for each asymptote, for a maximum of 3 points)

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Free-Response Question 2—with calculator (worth 15 points)

2. The manager of Best Bakery finds it costs \$3000 to make 500 apple pies a week or \$2300 to make 325 apple pies a week.

A. Assuming a linear relationship, express the cost of production, $f(p)$, as a function of the number of apple pies made, p.

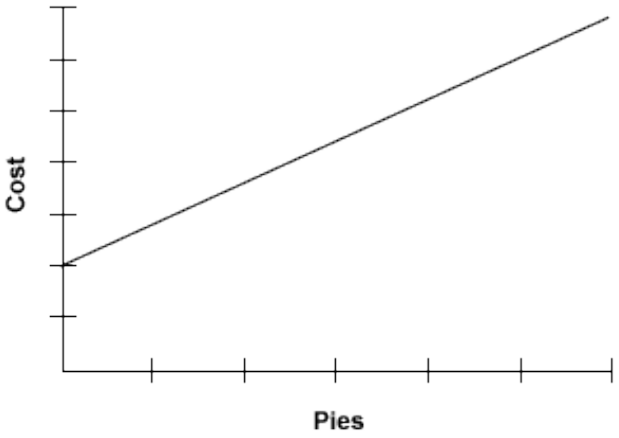
# pies (p)	cost $f(p)$
500	\$3000
325	\$2300

Answer: slope $= \frac{\Delta \text{cost}}{\Delta \text{pies}} = \frac{3000-2300}{500-325} = \frac{700}{175} = 4$ (1 point)

$f(p) - 3000 = 4(p - 500) \rightarrow f(p) = 4p + 1000$ (3 points; 1 point for point-slope form and 2 points for solving for $f(p)$)

B. Graph $f(p)$.

Answer:



(2 points for graphing the line from Part A)
(2 points for correctly labeling the axes)

C. In your own words, interpret the meaning of the slope of the graph of $f(p)$.

Answer:
This graph has a slope of 4, which means that each additional pie made costs the company an additional \$4. (2 points; other valid interpretations may be awarded full credit)

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D. State the value of $f(0)$ and interpret its meaning in this problem.

Answer:
$f(0) = 4(0) + 1000 = 1000$ (1 point; full credit is given if student correctly used the formula from Part A)

Best Bakery's fixed costs are $1000 per week. (2 points; other valid interpretations may be awarded full credit)

E. Determine the domain of $f(p)$. Justify your answer with an explanation for the domain.

Answer: The domain would represent the number of apple pies that Best Bakery can make per week. A negative number of pies is not applicable. Therefore the domain is $[0,\infty)$ or $[0, p_{\max}]$ where $p_{\max}$ is some decided-upon value for the maximum number of pies that the bakery can make in a week. (2 points for correct answer with valid explanation; 1 point for correct answer with no explanation)

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